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Green Chemistry Education: Catalyzing change for a sustainable future

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Beyond Benign
www.beyondbenign.org

Beyond Benign

- Non-profit organization
- Headquarters located in Wilmington, MA (~20 minutes north of Boston)
- Employees based in MA and CO; Curriculum specialists nation-wide and world-wide
- Co-founded by John Warner and Amy Cannon in August of 2007



Mission and Vision Statements



Beyond Benign is dedicated to providing future and current scientists, educators and citizens with the tools to teach and learn about green chemistry in order to create a sustainable future.

Beyond Benign's vision is to revolutionize the way chemistry is taught to better prepare students to engage with their world while connecting chemistry, human health and the environment.



Why Revolutionize Chemistry Education?

- Change public perception of chemistry
- Green chemistry is the best practices of chemistry of today and the future



Chemistry fundamentals are of paramount importance



***But only truly make sense to your students if they are
connected to something in their world.***

Pathways of Green Chemistry Education



K-12



College



Professional

Awareness	<p>Conferences</p> <p>Informational Resources</p>	<p>Conferences</p> <p>Student Workshops</p> <p>Informational Resources</p> <p>Green Chemistry Journals</p>	<p>Conferences</p> <p>Student Workshops</p> <p>Informational Resources</p> <p>Industrial Workshops</p> <p>Green Chemistry Journals</p>
Support	<p>Peers</p> <p>Administrative</p> <p>Financial</p>	<p>Peers</p> <p>Administrative</p> <p>Financial</p>	<p>Peers</p> <p>Administrative</p> <p>Financial</p>
Resources	<p>Curricula</p> <p>Professional Development</p>	<p>Curricula</p> <p>Professional Development</p>	<p>Curricula</p> <p>Professional Development</p>

Pathways of Green Chemistry Education



K-12

Awareness

Conferences
Informational Resources

Support

Peers
Administrative
Financial

Resources

Curricula
Professional Development

- Alternative Lesson Plans and Labs:
 - Introducing GC
 - Industrial Case Studies
 - Drop-In Replacements
 - Linked to state and national standards
- Professional Development Workshops
- On-line course (Registration deadline: Oct. 7)

Systematic Change:

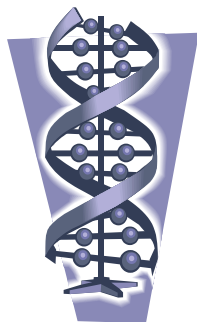
- Course integration (informational resources)
- Administrator Training
- Reforming National and State Standards
- Regional Networks (NE EPA GC Program)

K-12 Curriculum Development and Teacher Training

- Green Chemistry

- »*Solutions in Green Chemistry*

- »*Chemistry with a Conscience*



- Biotechnology & Genetics

- »What's Up with Gena

- »How the Fur Flies

- Math & Green Engineering

- »*ME in Context*

- »*ME in Your Neighborhood*



Core Philosophies



- ✓ Teachers teaching teachers
- ✓ Core values of sustainability
- ✓ Multiple learning styles and abilities
 - ✓ Demystifying science
 - ✓ Activity based approaches
- ✓ Open access education materials
- ✓ Based on industrial approaches to Green Chemistry



- <http://www.beyondbenign.org/K12education/highschool.html>



• http://www.beyondbenign.org/professional/fall_2011_high-school-green-chemistry.html

Course: Incorporating Green Chemistry into the High School: Lesson, lab and Practice - Windows Internet Explorer

http://greenchemistrynow.org/courseware/course/view.php?id=2

how to do screenshot in windows

Course: Incorporating Green Chemistr...

Incorporating Green Chemistry into the High School: Lesson, lab and Practice

You are logged in as [Rachel Pokrandt](#) (Logout)

Beyondbenign courses ► GCHS101

Switch role to... Turn editing on

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Topic outline

- [Welcome](#)
- [Video Intro](#)
- [Technical requirements](#)
- [General questions](#)
- [Syllabus](#)

1 **What is Green Chemistry?**

In this first lesson you will be exposed to resources that will help you begin to understand where the idea of Green Chemistry came from and what the vision for a Green Chemistry future might be.

Please work your way through the learning resources and then post comments in the 3 forum areas.

- [Dr. Warner introduces Green Chemistry - click on the 'Intellectual Ecology' video!](#)
- [Listen to Dr. Paul Anastas introduce Green Chemistry](#)
- [Why Green Chemistry in Education?](#)
- [The 12 Principles Explained](#)
- [Review Green Chemistry background information from Beyond Benign](#)
- [Lesson 1 forum](#)

Upcoming Events

There are no upcoming events

[Go to calendar...](#)

[New Event...](#)

Recent Activity

Activity since Thursday, 16 June 2011, 12:13 PM

[Full report of recent activity...](#)

New forum posts:

16 Jun, 12:45
T.J. Edwards
["Re: 2. Chemists can be scary!"](#)

16 Jun, 12:50
T.J. Edwards
["Re: 2. Chemists can be scary!"](#)

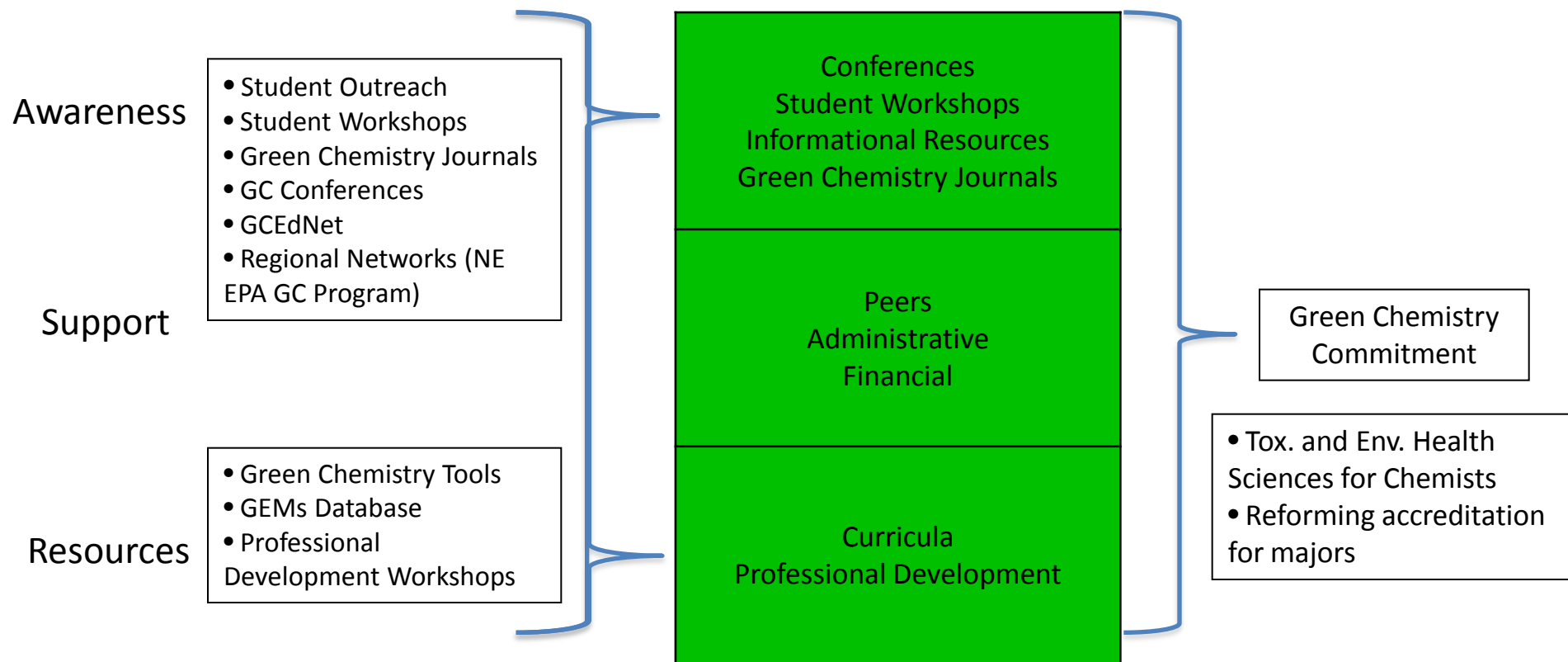
Internet | Protected Mode: On

10:11 AM

Pathways of Green Chemistry Education



College



Academia

- Community College Professor Training & Resources
- http://www.beyondbenign.org/professional/community_college.html
- Courses
 - Simmons College, Fall 2011 – Toxicology and Environmental Health Sciences
 - Toxicology for Chemists Workshop for Faculty
- Green Chemistry Commitment
 - The *Green Chemistry Commitment* is a systematic response to the demand for safer, non-toxic products and processes, shifting our educational institutions to prepare students to enter the workforce armed with the skills and knowledge to create society's next generation of sustainable materials. The *Commitment* is a bottom-up approach, allowing for schools, colleges and universities to begin to change the education of a scientist today.

Green Chemistry Commitment: The Call for Systematic Change

- A systematic, unifying approach
- Responding to demand from industry and students
- Raising awareness
- Providing support (peer, administrative, financial)
- Platform for resources
- Bringing green chemistry education to the next level

The Green Chemistry Commitment: Next Steps

Fall 2011:

Advisory board working
group

January 2012: New England
Green Chemistry
Commitment Summit
Meeting

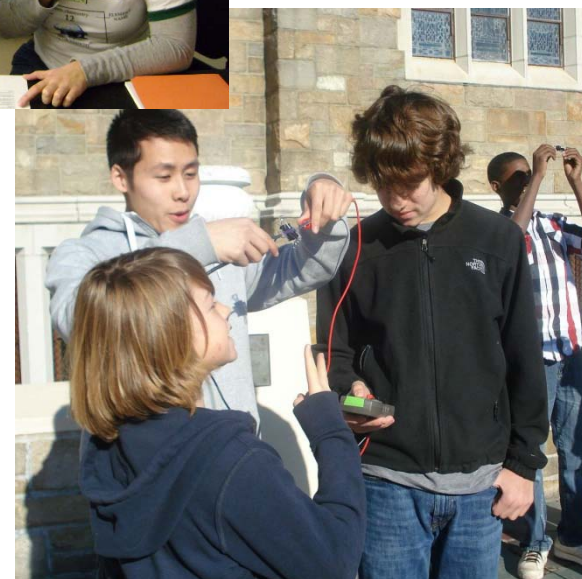
June 2012: First launch of
Commitment

Faculty Advisory Board:

- Arizona State University
- Bridgewater State University
- Gordon College
- Simmons College
- Suffolk University
- Tufts University
- University of California Berkeley
- University of Massachusetts
Boston
- University of Minnesota
- Worcester State University

Outreach Fellows Program

- College students (Gordon College, Salem State University, Boston College, Emmanuel College, Simmons College, Northeastern University, Suffolk University, Tufts University MIT)
- Inspiring K-12 students
- Green Chemistry Projects (greening labs, outreach, mentoring middle and high school students with science fair)



Pathways of Green Chemistry Education



Professional

Awareness

Support

Resources

Green Chemistry
Commitment

- Industrial Workshops
- Green Chemistry Journals
- Regional Networks (NE EPA GC Program)
- GC Conferences
- GC Roundtables

- Industrial Workshops
 - Professionals
 - Technicians/Workers

Conferences
Student Workshops
Informational Resources
Industrial Workshops
Green Chemistry Journals

Peers
Administrative
Financial

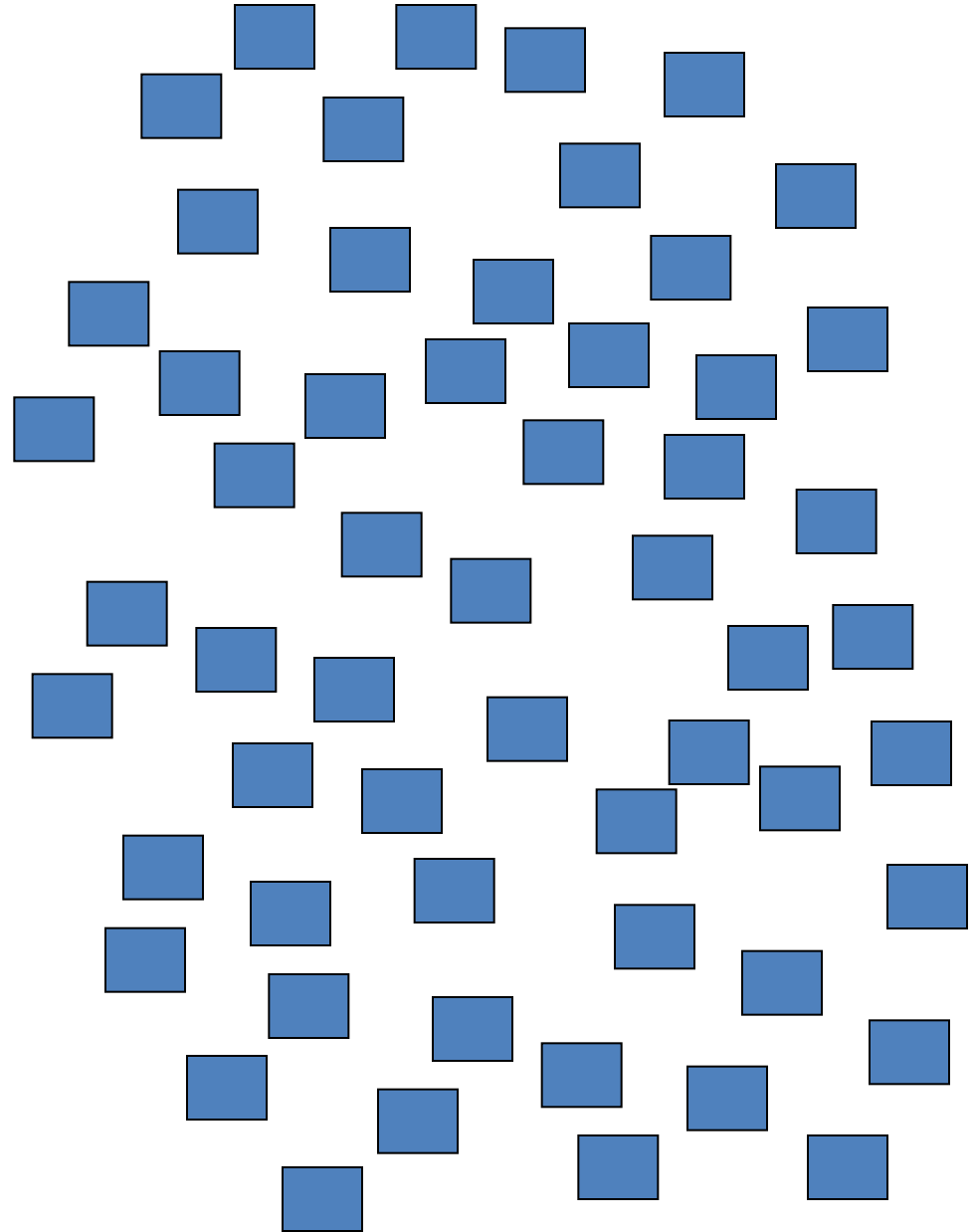
Curricula
Professional Development

Professional Tools

- **Professional Trainings for Scientists and Executives**
 - http://www.warnerbabcock.com/professional_training/training_courses.asp
- **iSUSTAIN™ Green Chemistry Index**
 - A tool which provides a methodology to generate a sustainability-based score for chemical products and processes using the 12 principles of green chemistry
 - Designed for college students, professors, and scientists
 - <http://www.beyondbenign.org/isustain/isustain.html>

Of all the products and processes...

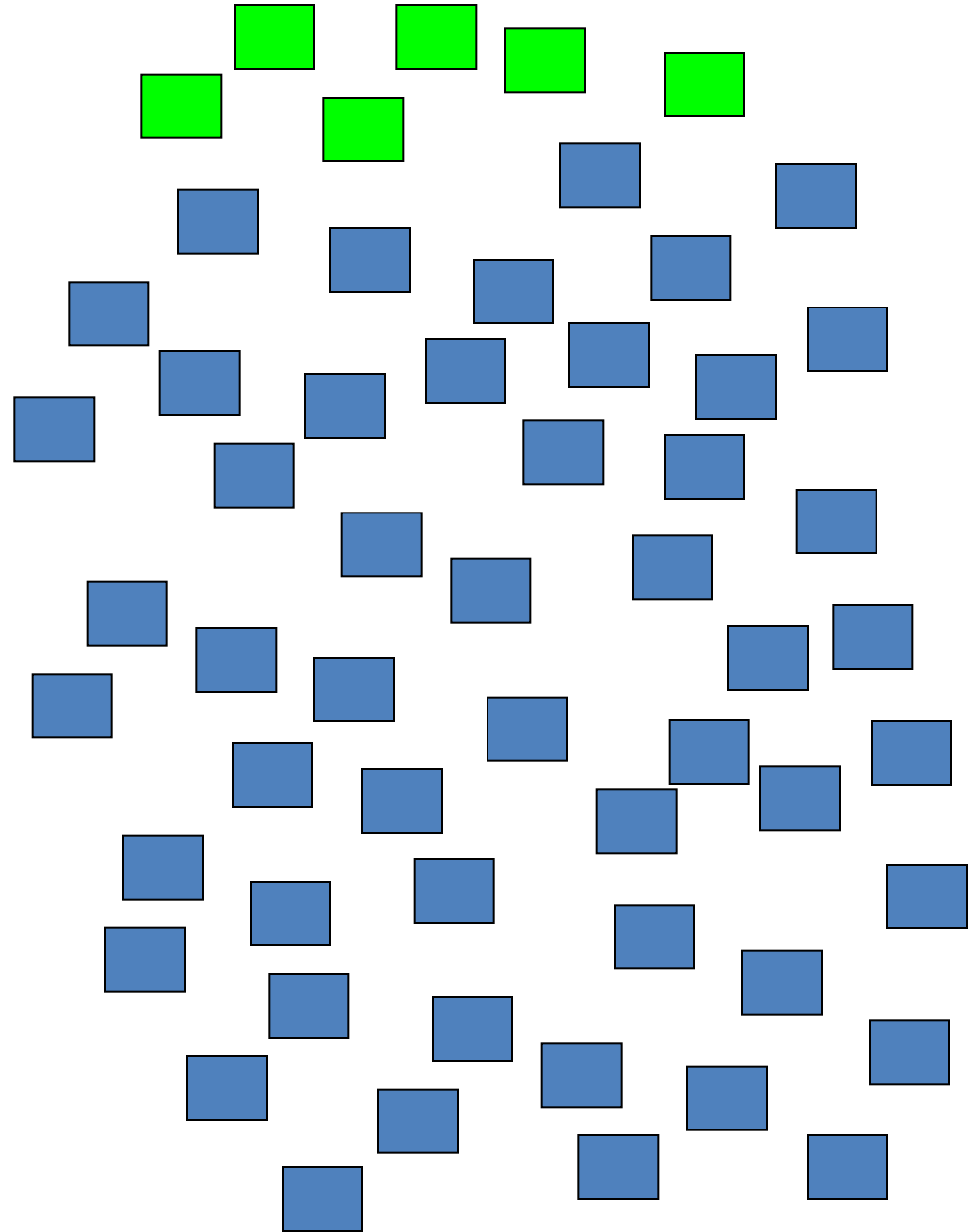
Maybe 10% are benign...



Of all the products and processes...

Maybe 10% are benign...

Maybe 25% more are
relatively easy to do...

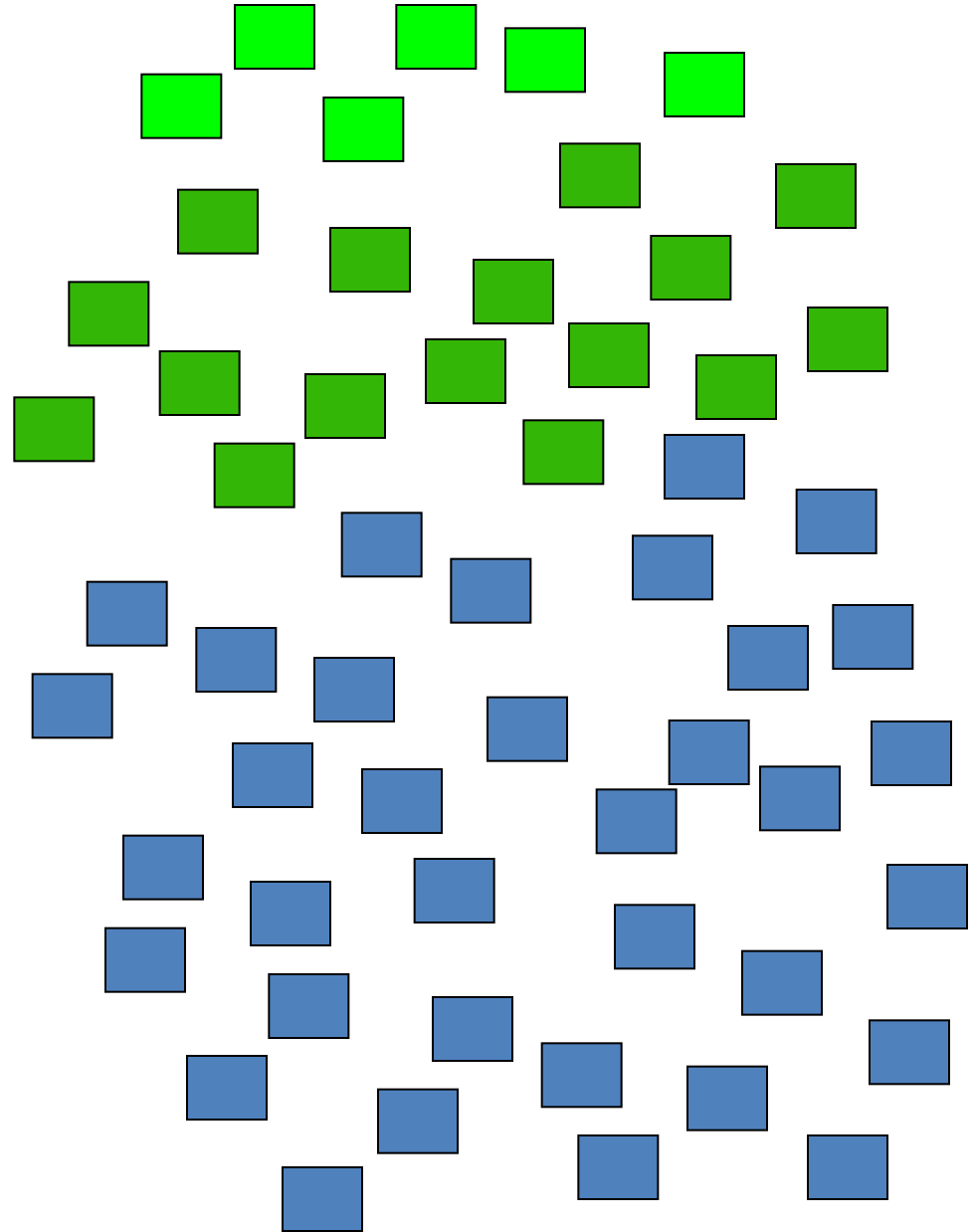


Of all the products and processes...

Maybe 10% are benign...

Maybe 25% more are
relatively easy to do...

Who is going to invent
the other 65%?

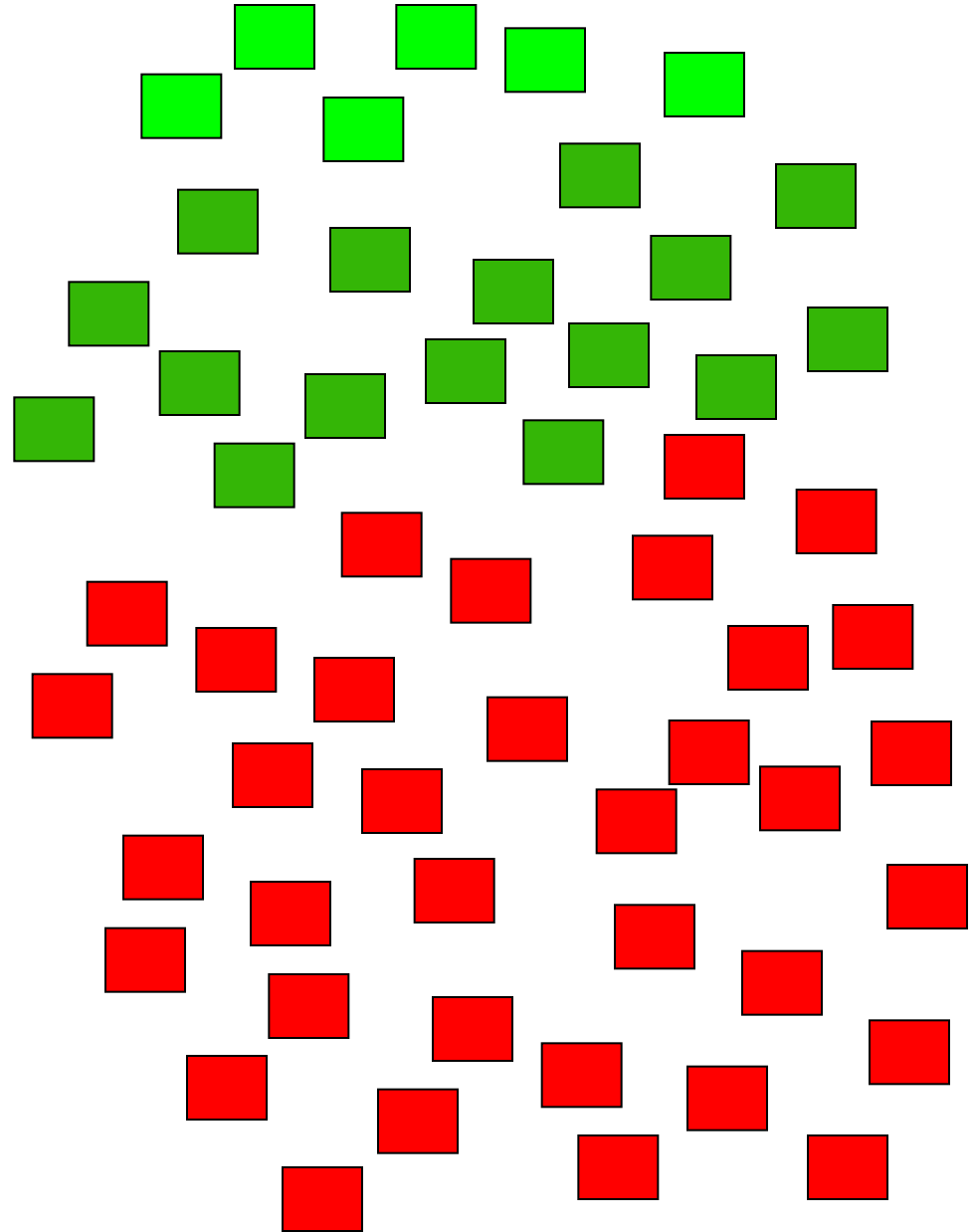


Of all the products and processes...

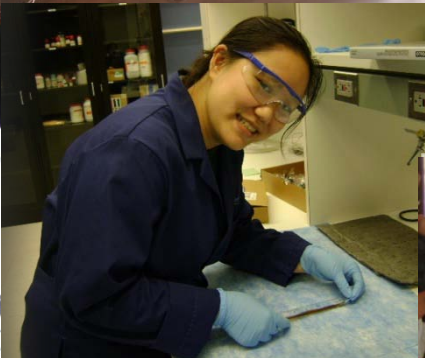
Maybe 10% are benign...

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relatively easy to do...

Who is going to invent
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What's More Important?



Green Chemistry Resources on the Web

- [American Chemical Society's Green Chemistry Institute](#)
- [U.S. Environmental Protection Agency, Office of Pollution Prevention, Green Chemistry](#)
- [Greener Education Materials for Chemists](#)-University of Oregon
- [Royal Society's Green Chemistry Network](#)-UK website
- [WWW Chemistry Guide](#) - comprehensive and evaluated guide to web sites related to chemistry and the chemical industry.
- [Center for Green Chemistry & Engineering at Yale](#)
- [Green Chemistry Centre of Excellence at York](#)- UK website
- [Green Chemistry at University of Scranton](#)
 - <http://academic.scranton.edu/faculty/cannm1/greenchemistry.html>

Additional Information

- Beyond Benign

www.beyondbenign.org

- Kate Anderson

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